

Data Plotting



Plotting Options

The 'Data' menu controls which data components are plotted and the plotting options.

The screenshot shows the 'Data' menu in D3PLOT with the following settings and annotations:

- Data category:** Points to the 'Stress' dropdown menu.
- Data component:** Points to the 'X_DIRECT_STRESS' dropdown menu.
- Show min / max points in graphics window:** Points to the 'Show max & min only' dropdown menu.
- Through thickness integration point plotting options for shell elements / layer for composite parts:** Points to the 'MIDDLE surface' dropdown menu.
- In-plane integration point plotting options:** Points to the 'ALL int pts' dropdown menu.
- Data averaging across nodes / elements:** Points to the 'ON' dropdown menu.

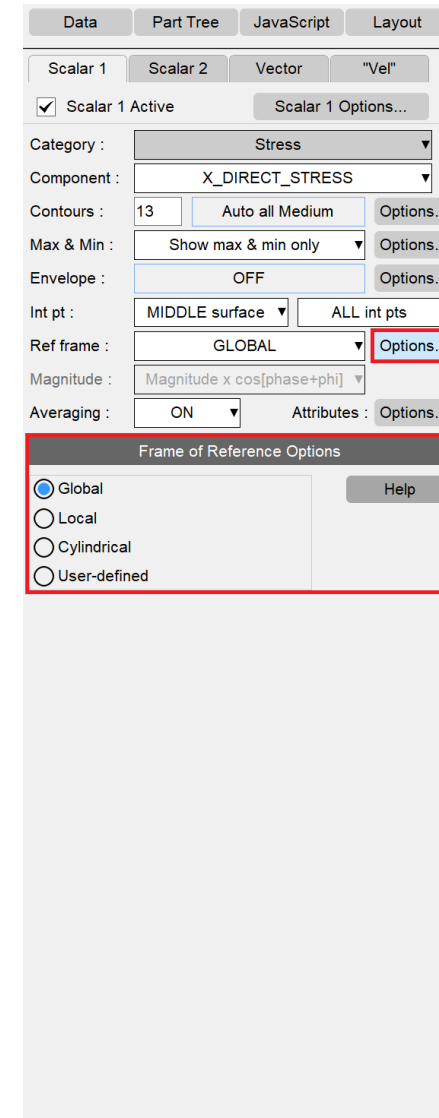
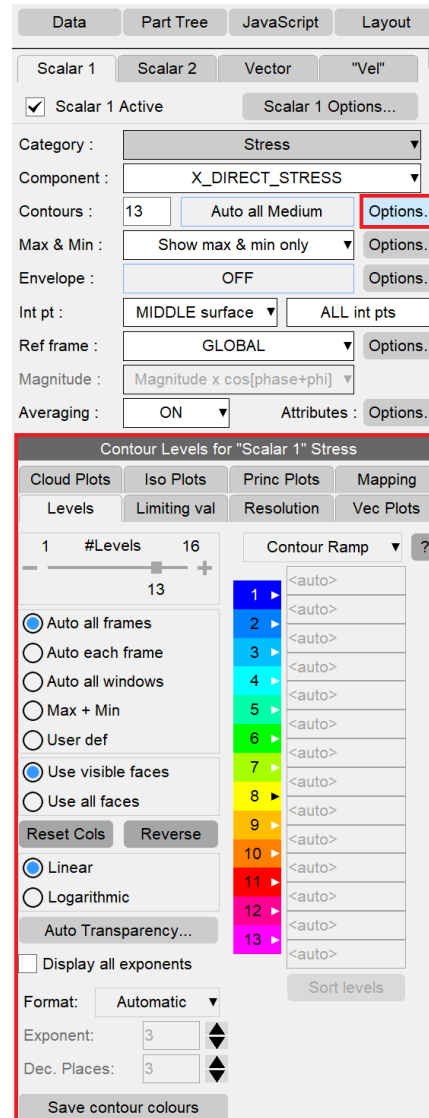
Other visible settings include: Scalar 1 Active, Contours: 13, Auto all Medium, Envelope: OFF, Ref frame: GLOBAL, Magnitude: Magnitude x cos[phase+phi], and Attributes: Options..

Reference frame for stresses and strains:

- Global – Default setting.
(In almost all cases LS-DYNA writes stress/strain tensors for solids and shells in the global Cartesian system.)
- Local - Global stresses are converted by D3PLOT to a local system based on the element nodal vectors N1N2 and N1N3.
(Care is needed for orthotropic materials, as the user can specify whether LS-DYNA uses global or local output of stress/strain.)
- Cylindrical – Local axis is calculated based on a cylindrical co-ordinate system.
- User-defined

Further Options

- Some of the plotting options within the 'Data' menu have an 'Options...' button next to them. Clicking this button will display further options for that specific plotting option in the lower half of the 'Data' menu.



Contour Options

There are a range of further Contour Options accessed by different tabs.

The 'Levels' tab allows control over the number, colour, etc. of the contour levels.

Contour Levels for "Scalar 1" Stress

Cloud Plots | Iso Plots | Princ Plots | Mapping
Levels | Limiting val | Resolution | Vec Plots

1 #Levels 16
 - 13 +

Contour Ramp ▾ ?

☐ Auto all frames
☐ Auto each frame
☐ Auto all windows
☒ Max + Min
☐ User def

☒ Use visible faces
☐ Use all faces

Reset Cols Reverse

☒ Linear
☐ Logarithmic

Auto Transparency...

☐ Display all exponents

Format: Automatic ▾

Exponent: 3

Dec. Places: 3

Save contour colours

Pre-defined colour schemes

Manually enter the values for the contour levels.

Values can only be entered for active text boxes. For **Max + Min** or **User def** these are the levels ticked on the right.

Adjust colour of each contour level

Interpolation of intermediate contour thresholds

Set transparency to vary with data value

Number format options

Number of contour levels

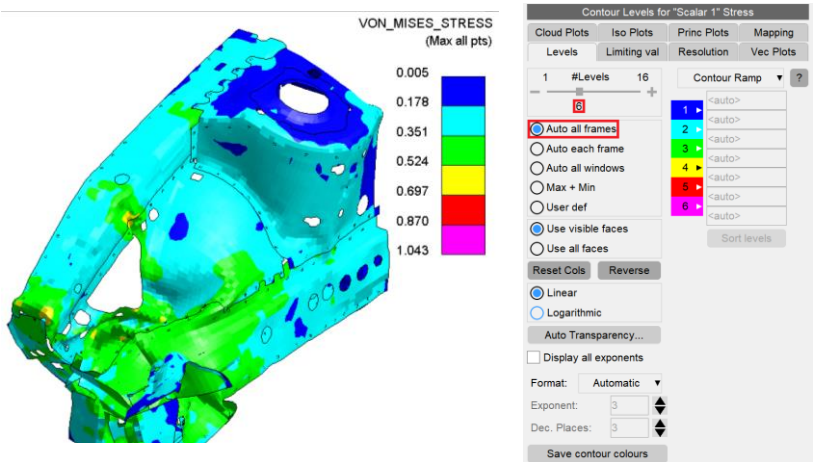
Automatic/manual contour levels:

- **Auto all frames** - Automatically set contour levels using the minimum and maximum data values across all frames.
- **Auto each frame** - Automatically set contour levels using the minimum and maximum data values for each frame separately.
- **Auto all windows** - contour bounds synchronised across multiple windows that are in selection in the current page.
- **Max + Min** - contour levels are automatically spaced with user defined minimum and maximum values.
- **User def** - any subset of contour levels can be defined by the user.

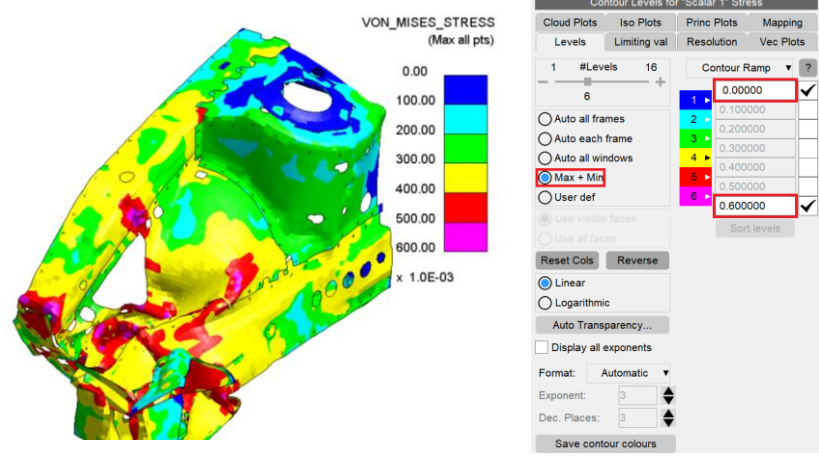
1	-0.118172E-02	✓
2	-0.929776E-03	
3	-0.677832E-03	
4	-0.425888E-03	
5	-0.173945E-03	
6	0.770992E-04	
7	0.329943E-03	
8	0.581887E-03	
9	0.833831E-03	
10	0.108577E-02	
11	0.133772E-02	
12	0.158908E-02	
13	0.184161E-02	
14	0.209355E-02	✓

Contour Options

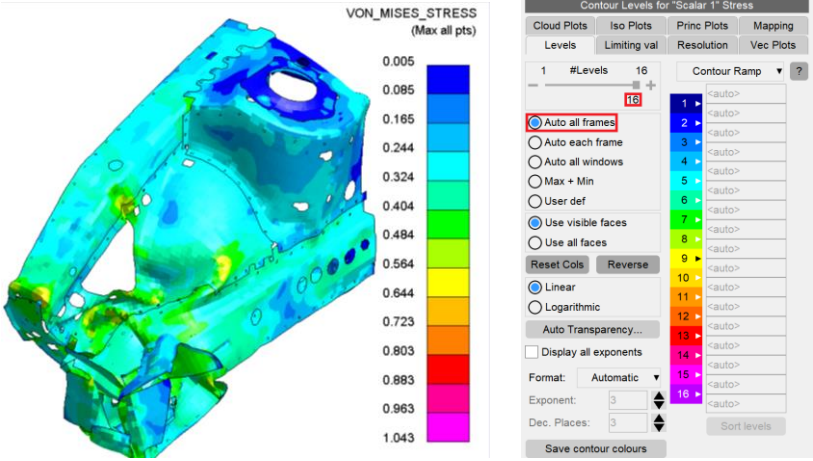
Control settings: Auto option – 6 levels



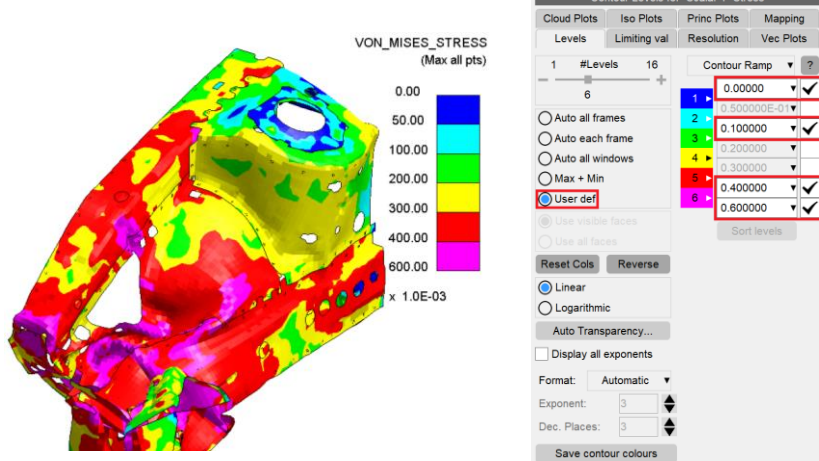
Control settings: Max + Min – enter the max and min values



Control settings: Auto option – 16 levels



Control settings: User def – enter more the levels manually

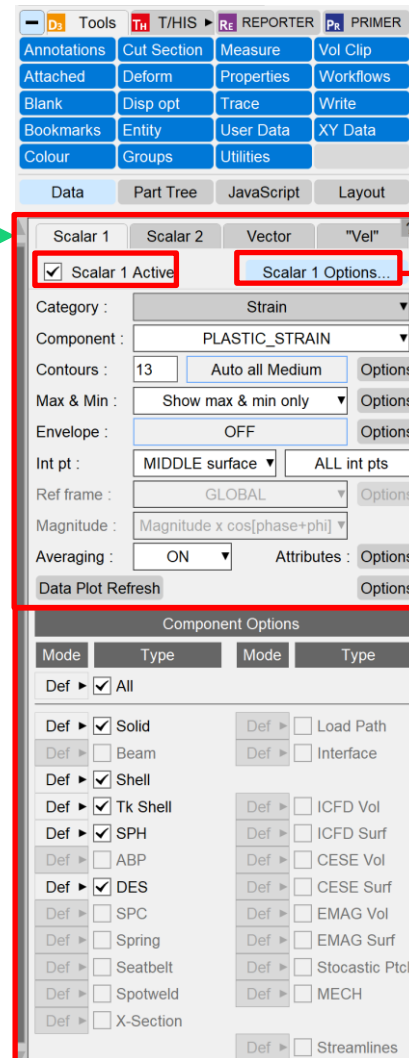


Advanced – Plotting Multiple Data Components

Sometimes it is desirable to plot several data components simultaneously on one plot.

For example; in a fluid-structure interaction, the data plot can show both the fluid pressure and the stress on the shells.

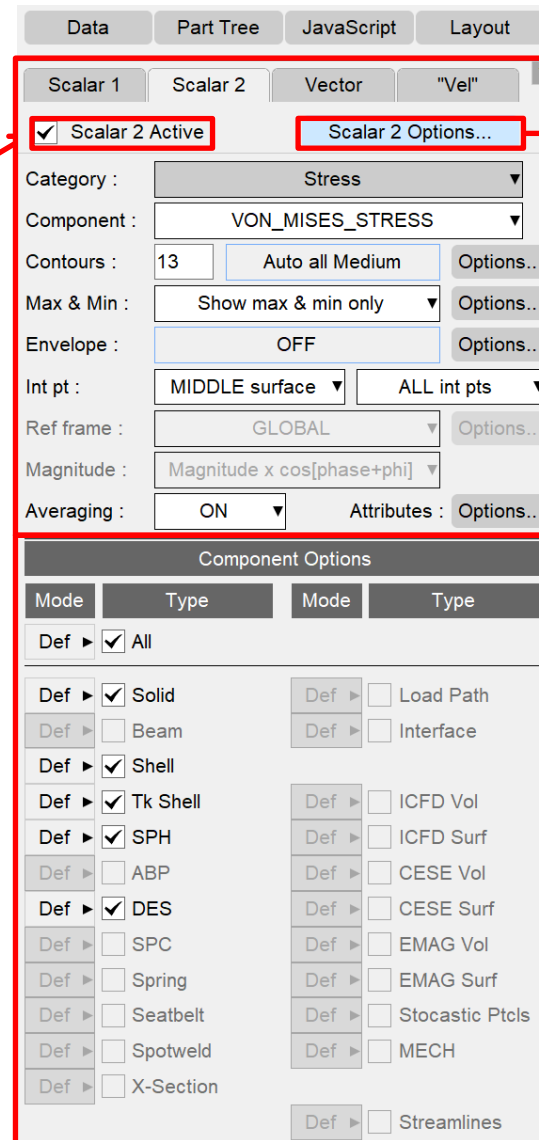
1. To plot several data components, within the 'Data' menu ensure the 'Scalar 1' tab is selected. In this tab, select the first data component to be displayed. Ensure the 'Scalar 1 Active' box is ticked, else the first data component will not be displayed.



2. Clicking the 'Scalar 1 Options' button, displays the 'Component Options' menu. Within this menu, the entity type (e.g. Shell) which the data component is plotted for can be controlled. For example, shells cannot display two (scalar) data components. If both Scalar 1 and Scalar 2 are active for an entity, the Scalar 2 data will be displayed. Also in this menu, a plotting mode for each entity can be chosen (e.g. CT, SI, etc).

Advanced – Plotting Multiple Data Components

3. To plot the second data component ensure the 'Scalar 2' tab is selected within the 'Data' menu. Within this tab, select the second data component required to be displayed. Ensure the 'Scalar 2 Active' box is ticked, else the second data component will not display.

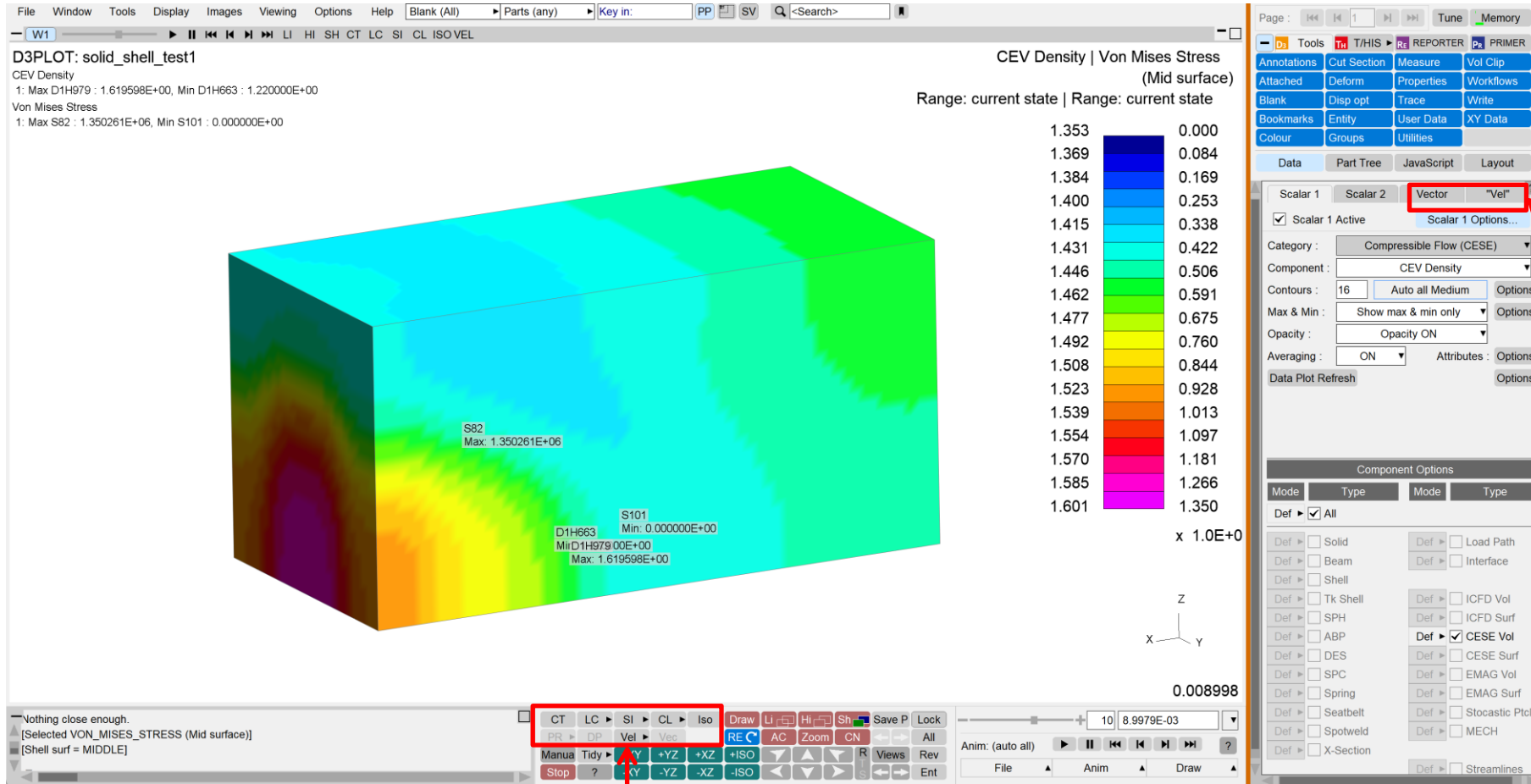


The screenshot shows the 'Data' menu in the D3PLOT software. The 'Scalar 2' tab is selected. The 'Scalar 2 Active' checkbox is checked. The 'Scalar 2 Options...' button is highlighted. The 'Component Options' section shows various entity types with checkboxes for selection.

Mode	Type	Mode	Type
Def ▶	<input checked="" type="checkbox"/> All		
Def ▶	<input checked="" type="checkbox"/> Solid	Def ▶	<input type="checkbox"/> Load Path
Def ▶	<input type="checkbox"/> Beam	Def ▶	<input type="checkbox"/> Interface
Def ▶	<input checked="" type="checkbox"/> Shell		
Def ▶	<input checked="" type="checkbox"/> Tk Shell	Def ▶	<input type="checkbox"/> ICFD Vol
Def ▶	<input checked="" type="checkbox"/> SPH	Def ▶	<input type="checkbox"/> ICFD Surf
Def ▶	<input type="checkbox"/> ABP	Def ▶	<input type="checkbox"/> CESE Vol
Def ▶	<input checked="" type="checkbox"/> DES	Def ▶	<input type="checkbox"/> CESE Surf
Def ▶	<input type="checkbox"/> SPC	Def ▶	<input type="checkbox"/> EMAG Vol
Def ▶	<input type="checkbox"/> Spring	Def ▶	<input type="checkbox"/> EMAG Surf
Def ▶	<input type="checkbox"/> Seatbelt	Def ▶	<input type="checkbox"/> Stochastic Ptcls
Def ▶	<input type="checkbox"/> Spotweld	Def ▶	<input type="checkbox"/> MECH
Def ▶	<input type="checkbox"/> X-Section		
		Def ▶	<input type="checkbox"/> Streamlines

4. It is important to ensure that the same entity types are not selected for the Scalar 2. If both Scalar 1 and Scalar 2 are active for an entity, the Scalar 2 data will be displayed.

Advanced – Plotting Multiple Data Components



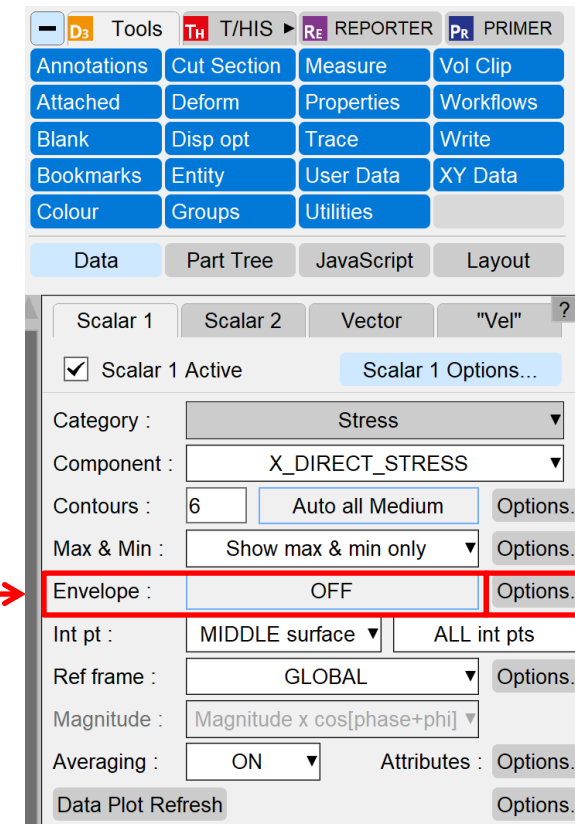
This example of plotting several data components is also valid for plotting 'Vector' and 'Vel' data components.

5. It is necessary to select a data plotting mode for the model, in order to display both data components.

Advanced – Envelope Plotting

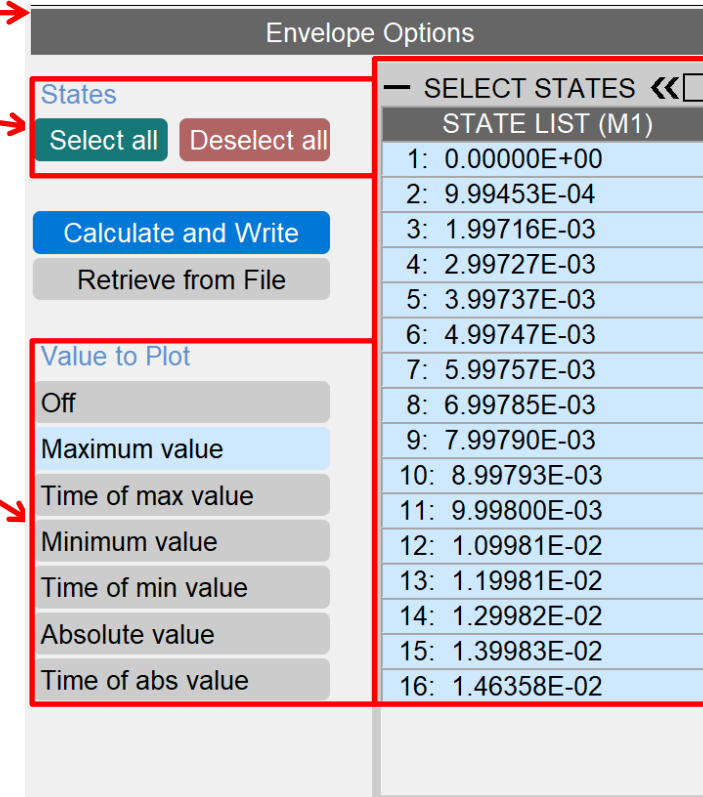
Envelope plot allows the entire analysis (or selected states) to be scanned and the envelope of the result to be plotted. Envelope plotting can be used to plot the minimum, maximum or the absolute maximum data values or the times at which this occurs.

1. To select which data value to plot, click the 'Options' button.



Advanced – Envelope Plotting

2. Within the 'Envelope Options' menu, the 'Component' to be plotted (e.g. Maximum value) can be chosen. Also the 'States' which the values occur can be chosen.

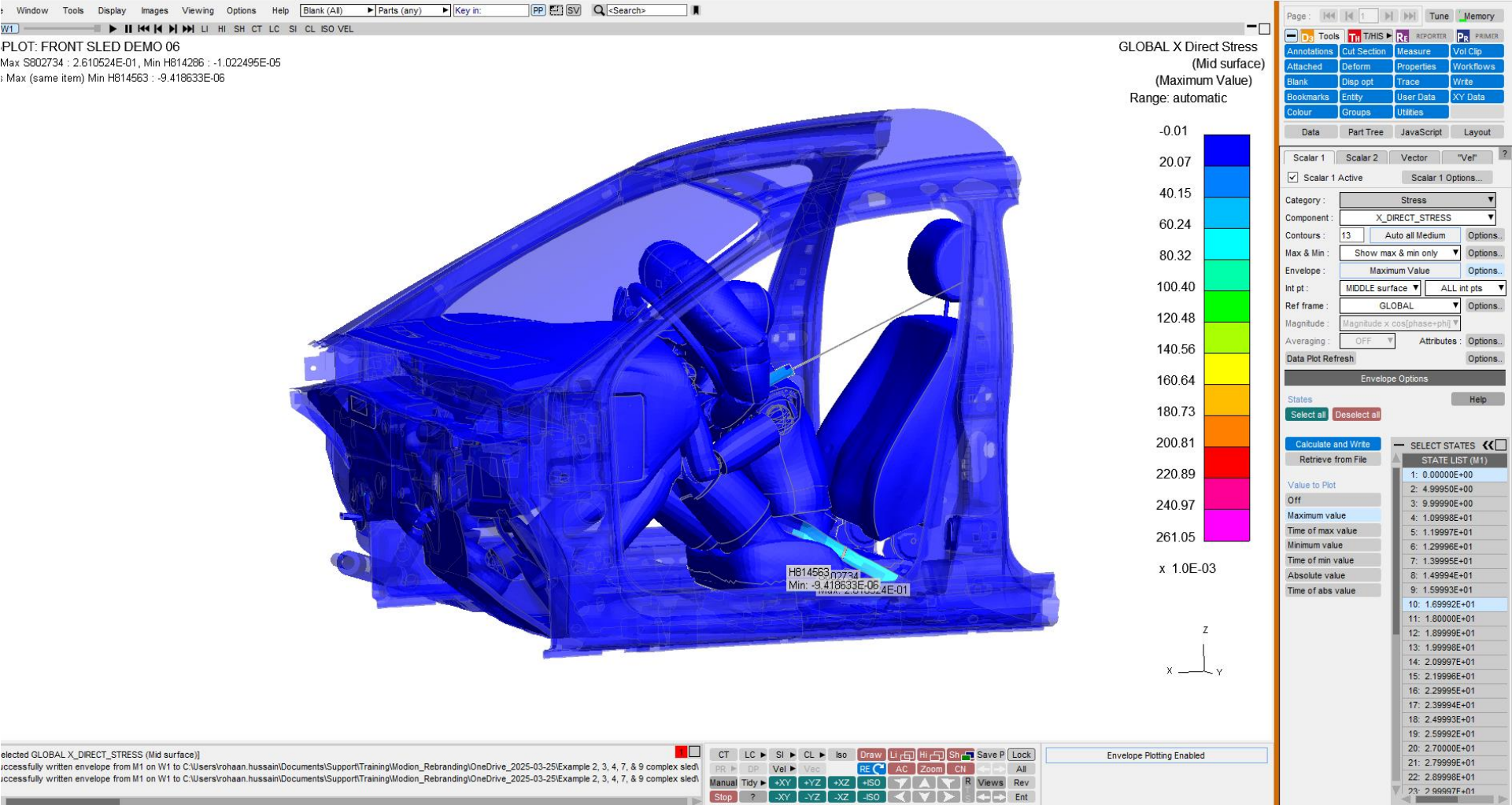


The screenshot shows the 'Envelope Options' dialog box. It has a title bar 'Envelope Options'. Below it, there are two main sections. The first section is titled 'States' and contains a 'Select all' button (green) and a 'Deselect all' button (red). Below these are two buttons: 'Calculate and Write' (blue) and 'Retrieve from File' (grey). The second section is titled 'Value to Plot' and contains a list of options: 'Off', 'Maximum value', 'Time of max value', 'Minimum value', 'Time of min value', 'Absolute value', and 'Time of abs value'. To the right of these sections is a table titled 'SELECT STATES' with a checkbox and a 'STATE LIST (M1)' containing 16 rows of state values. Red arrows point from the text box on the left to the 'States' section, the 'Value to Plot' section, and the 'SELECT STATES' table.

Envelope Options	
States	SELECT STATES <input type="checkbox"/>
Select all	Deselect all
Calculate and Write	
Retrieve from File	
Value to Plot	STATE LIST (M1)
Off	1: 0.00000E+00
Maximum value	2: 9.99453E-04
Time of max value	3: 1.99716E-03
Minimum value	4: 2.99727E-03
Time of min value	5: 3.99737E-03
Absolute value	6: 4.99747E-03
Time of abs value	7: 5.99757E-03
	8: 6.99785E-03
	9: 7.99790E-03
	10: 8.99793E-03
	11: 9.99800E-03
	12: 1.09981E-02
	13: 1.19981E-02
	14: 1.29982E-02
	15: 1.39983E-02
	16: 1.46358E-02

Advanced – Envelope Plotting

3. The plot should then display the requested value(s) at the selected states. For this particular example, the plot displays the maximum value over the selected envelope plot states (1, 10, 20 and 30).



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